INDIANA UTILITIES REGULATORY COMMISSION

ELECTRIC SERVICE QUALITY REVIEW

WORKING GROUP ON REPORTING REQUIREMENTS FOR RELIABILITY STATISTICS

1. Introduction

On November 6, 2002, the Indiana Utility Regulatory Commission (IURC) issued a data request to review the current state of electric service quality. The IURC announced a series of workshops that would directly lead to rulemaking or lay the groundwork for future rulemaking on specific issues. In the announcement, the IURC stated, *"Over the last few years, Indiana electric utilities have increasingly relied on new technology or procedures to maintain electric service quality. However, the Commission is concerned that technology and procedures alone may not be enough to maintain electric service quality at the highest possible level."* In addition, the Commission stated concerns that *"the level of reliability be consistent among electric service providers in our state."*

On March 4, 2003, the Commission hosted the first workshop to further explore the electric service quality issues addressed in the data request. The Commission was pleased with the results of the first workshop, which included the ongoing testing of a new outage reporting procedure and the establishment of a Working Group (WG) *"to develop reporting requirements for reliability statistics*." Members of the WG include:

Name	**Company**
Charles Bailey	Lebanon Utilities and liaison to municipals and co-operatives
Mark Carr	American Electric Power
Larry Conrad	Cinergy/PSI Energy
Timothy Dehring	NIPSCO
Barry Feldman	IPL
Gary Husky	Vectren

The WG met after subsequent IURC workshops and met separately by conference call. The WG's approach was to maintain adequate service and keep an appropriate balance between cost and reliability rather than trying to achieve the highest possible level of reliability. The WG believes that the pursuit of electric reliability performance involves a continuous balance between costs and the customer value associated with higher or lower levels of electric reliability. The "highest" level of electric reliability may not be one that optimizes this value proposition to customers. Also, the WG's approach recognized that Indiana utilities are meeting their statutory obligation to provide reasonably adequate service and facilities even though measured reliability may not be consistent among electric service providers. In fact, consistent reliability between electric service providers may not necessarily be appropriate or cost effective.

This document summarizes the work of the WG for reporting requirements for reliability statistics with the understanding that consistent and regular reports on reliability would help the IURC assess electric reliability performance in Indiana. It recommends a process and a format for utilities to consistently report their own electric reliability performance to the IURC.

Subsequent sections of this report highlight the scope of the Working Group's review and recommendations for an electric reliability reporting process. Also, this report recommends enhancements to the new IURC test outage reporting process. Other annexes summarize utility responses to the commission's data request, highlight issues of electric reliability measurement often created by the implementation of new outage management technology, and offer insight to natural reliability variations in Indiana.

2. Scope of work

The Working Group coordinated with the IURC to develop a scope of work. The scope of work in this report is:

- Define a reporting mechanism for electric reliability performance
  - Define sustained and momentary outages
  - Define the appropriate metrics to measure and report electric reliability performance
  - Define the criteria under which reliability performance will be reported
  - Assess the current utility practices in the State with respect to data capture and data integrity related to electric reliability performance metrics
  - Discuss the impacts of modern technologies on the collection of reliability data and the impacts on reliability statistics
- Discuss the issues associated with the use of electric reliability performance data for the establishment of performance standards
- Discuss the issues associated with the IURC's newly defined outage reporting requirements and make recommendations for enhancement

3. Summary of data request responses

On November 6, 2002, the IURC sent a data request to Indiana utilities covering reliability reporting and other topics. The Working Group reviewed all questions to determine which questions were in scope of the Working Group assignment. After selecting the "in scope" questions, the Working Group prepared summaries of the utility responses. Annex, C, D, E, and F contain the response summaries prepared by the Working Group from the following utilities:

Wabash Valley Power Assn.
Jackson County REMC
Indiana Municipal Power Agency
Town of Knightstown
Tipton Municipal Utilities
Richmond Power & Light Co.
Indiana Michigan Power Co (AEP)
Marshall County REMC
NIPSCO
Indianapolis Power & Light Co.
Logansport Municipal Utilities
Vectren Energy Delivery
Edinburg Municipal Utilities
Harrison REMC
PSI/Cinergy
Frankfort City Light & Power
Crawfordsville Electric Light & Power
Indiana Industrial Group
Anderson Municipal Light & Power
Northeastern REMC
Mishawaka Utilities
Washington Municipal Utilities
Lawrenceburg Municipal Utilities

4. Recommendations on reliability statistics

- Utilities should report three reliability indices for sustained interruptions. They are:
    a. System Average Interruption Frequency Index (SAIFI)
    b. Customer Average Interruption Duration Index (CAIDI)
    c. System Average Interruption Duration Index (SAIDI)

  These three indices are the most widely used in the electric utility industry, are well defined by IEEE Recommended Practices, and are reasonably easy to understand. SAIFI indicates the average number of sustained interruptions per customers served. CAIDI relates to outage response time by indicating the average outage duration for those customers interrupted. SAIDI indicates the average amount of time that customers are without power. All three indices should be classified to include and exclude major events for a total of six measured numbers reported on an annual basis. A sample reporting form is in Annex A

- The frequency of reporting reliability data should be on an annual basis. Changes in reliability indices over short periods of time, especially intervals less than one year, are more indicative of impacts from external events than of true changes in reliability performance. Utilities compile reliability data over extended periods of time in order to make good decisions for improving reliability performance. This response typically requires combining the reliability data with other data, recognizing trends and other performance factors, analyzing and developing work plans to affect the trends, performing the work plans, and then allowing time to measure the results.

- Sustained outages should be defined as those outages with durations greater than 5 minutes. Momentary outages should be those outages with durations of 5 minutes or less. The primary purpose for two classifications of outage duration is to distinguish between
    a. “momentary” those outages that are restored by automatic operation and
    b. “sustained” those outages that require physical action at the scene of the outage by repair personnel.

  There are virtually no outages having automatic restoration with duration greater than five minutes and virtually no outages requiring repair personnel with duration less than five minutes. Thus five minutes is a good duration for classification between momentary and sustained. This is consistent with IEEE Recommended Practice. Utilities have used durations from one minute to more than five minutes for this classification. Some utilities will have to make changes to their reporting practices to accommodate the consistent approach.

- Sustained outages should include all outages not requested or caused by the customer regardless of source. Utilities may classify outages sources such as transmission, substation, wholesale supplier, etc. However, the outages from these various sources should be included in reliability statistics.

- Utilities use slightly different definitions for “customer” when calculating SAIFI, CAIDI, and SAIDI. This does not cause problems, and there is no reason to mandate a consistent approach. Customer count can be by revenue meter, premise, or other reasonable approach so long as the same method is used in the numerator and denominator of the recommended reliability metrics. SAIFI, CAIDI, and SAIDI all are

calculated as a ratio where number of customers is in the numerator and denominator of the ratio. The ratios will be indifferent to how a particular utility defines “customer” so long as each utility uses a consistent method over time.

- Differences in definition for major event should be allowed. The choice of definition usually is somewhat dependent upon the type of company, nature of the service territory and distribution system and whether the system is operated on a centralized or regional basis. The WG believes that these definitions vary for good reason and that a change to these definitions would jeopardize the continuity of existing historical data. It is better to allow differences in major event definitions to continue. This provides better trending of individual utility performance with historical data already in place. Each utility should clearly define its major event criteria and include that definition in the annual reliability report. Companies that do not have a major event definition may want to use ten percent of their total customers affected and the duration of the total restoration effort greater than 24 hours.
- Reliability metrics should not be compared between utilities, but rather to assess trends within a specific utility over an extended period of time. Utilities differ in geography, weather exposure, vegetation density, service territory, customer density, customer ownership interface, design, and operation. These differences cause significant variation in reliability performance metrics. Holding all utilities to the same reliability standards without regard to these differences is neither cost effective nor necessary. Annex I shows examples weather variation over various parts of Indiana and from year to year.
- Reliability data should be collected by the IURC for some period of time before considering the development of reliability performance standards. This data collection period would be used for general education of the interested parties and IURC staff. There still needs to be much discussion about the applicability and usefulness of actual performance standards. It would be useful for all parties to understand the details contained in the reliability data. Once this data has been gathered for a few reporting cycles, interested parties can intelligently discuss the appropriateness of any comparisons or standards.
- Reliability reporting for municipal electric utilities and REMC’s should be voluntary. The size of these utilities varies from over thirty-six thousand customers to less than two hundred customers (see Annex H). Each of these utilities is far smaller than any of the investor owned utilities. Requiring the smaller utilities to report could represent a hardship in manpower and available expertise. Most Rural Electric or Municipal utilities already have a short line of accountability from their elected representatives and most complaints are dealt with expeditiously. As a rule these utilities do not have Outage Management Systems and all data would need to be collected manually. A number of the larger utilities in this group currently calculate metrics, which could be collected if needed.
- Indices for momentary outages should not be reported. Few, if any, utilities have facilities to accurately and reliably gather the information required to calculate momentary metrics such as MAIFI. SCADA surveillance of substation breakers and line reclosers is required to accurately determine these metrics. Many utilities have some to none of their automatic equipment monitored by SCADA. Manual accumulation of mechanical counter data will not provide accurate data for this use. The cost of collecting momentary data by SCADA and the inaccuracy of manual collection techniques strongly suggest momentary outages should not be reported.

- The reported reliability data should be kept confidential and not made available to the general public. Common reliability indices are not as "plain vanilla" as they might appear at first. Utilities, recognizing the underlying assumptions, utilize the indices in conjunction with sound engineering and business practices to develop work plans. The public, and even other utilities, will not recognize the specifics included in the submitted data. Comparing one utility's performance against others' should be discouraged for the reasons outlined in this section and confidentiality is a step in that direction.
- Reporting of "worst performing" circuits should not be part of the reliability reporting process. Mandated investments or improvement targets on identified circuits could lead to sub-optimal deployment of the utility's resources. Identification of worst performing circuits is best used by utility personnel familiar with its strengths and weakness. It is recommended that the IURC continue to allow each individual utility to use the identification of worst performing circuits as it determines appropriate.

5. Recommendations on outage reporting guidelines

In early 2003, the commission initiated an outage reporting process to facilitate the exchange of outage related information between the IURC, utilities, interested customers, and media. As a result of participating in this process, members of this Electric Reliability Reporting Working Group recommend the following enhancements to the process.

1. Limit update reports to four times per day in lieu of the current two-hour requirement. These update times are recommended to be 6:00AM, 11:00AM, 4:00PM, and 9:00PM. These times will align with periods of peak customer interest and accommodate media deadlines. Additionally, experience with the test reporting system indicates that reports are not needed every two hours - especially late at night and during the early morning hours.
2. Change the preferred report method to e-mail with an option to report by telephone. This will allow for more consistency in the type and format of information provided.
3. Designate the last report to be submitted by a utility at the conclusion of the outage event to be the "Final Report". This will relieve the burden of submitting a follow-up report containing similar information to what has already been submitted.
4. Revise the reporting form as recommended in Annex B

It is the belief of the Electric Reliability Reporting Working Group that adoption of these changes will improve the efficiency of the outage reporting process while still facilitating effective exchange of outage related data to all interested stakeholders.

ANNEX A – ANNUAL RELIABILITY REPORTING FORM

This format is recommended to provide consistent reporting of electric reliability. The report should be filed with the IURC on an annual basis for calendar year ending December 31.

(COMPANY NAME) ELECTRIC RELIABILITY REPORT TO THE INDIANA UTILITY REGULATORY COMMISSION		
	REPORTING YEAR (12 Months Ending:December 31, xxxx)	
ELECTRIC RELIABILTY MEASURE	TOTAL	WITHOUT MAJOR EVENTS*
SAIFI		
SAIDI		
CAIDI		
COMPANY DISCUSSION OF RESULTS		
* MAJOR EVENT DEFINITION		
Submitted by:		Date:
Title:		

ANNEX B – PROPOSED IURC OUTAGE REPORTING FORM

The following revised outage reporting from is recommended by the Reliability Reporting Working Group.

Reporting Conditions:

- Investor-owned utilities must report outages lasting two or more hours and affecting 2% or 3,000 of their customers, whichever is less.
- Municipal and cooperative utilities must report outages lasting two hours or more and affecting 5% or 1,000 customers, whichever is less.
- The report should be made to the commission as soon as possible after the two-hour and customer affected level has been reached. Reporting to the commission shall be accomplished via e-mail addressed to **outage@urc.state.in.us**. Although less preferred, reports may also be made by telephone to **(317) 234-2723**
- Utilities are encouraged to report any outage they believe might cause public concern, for example a large housing development or a segment of the business district during business hours, even if the outage does not meet the duration/customer level threshold.

Required Information: **Final Report: _____YES _____NO**

Contact Information	
Name of Utility:	
Utility Contact Representative:	
Contact Phone:	
Outage Information	
Estimated # of Customers Affected:	
Interruption(s) Start Date/Time:	
Duration of Interruption(s):	
Location of Interruption(s): (County and Address)	
Cause of Interruption(s):	
Estimated Service Restoration Time:	
Reported By:	
Date/Time:	

Updates to On-going Outages: Following the initial outage report, updates shall be provided at 6:00 AM, 11:00AM, 4:00PM, and 9:00 PM local time until the problem is resolved. These update times are intended to coordinate with typical media cycles and peak customer interest periods. In the case of an extreme emergency, a schedule will be agreed to by the commission and utility. For example in the case of widespread tornado damage where the utility agrees to report the status of repairs as major circuits come back on line. The last report to be submitted by a utility shall be noted as the "Final Report" for this event.

Contact Person: Each utility must provide the commission with a contact person in case of inquiries on outages the utility not reported to the commission. During significant restoration events, additional information requested by the commission should be directed to the individual listed on the latest report from the utility.

ANNEX C – RESPONSE SUMMARIES FOR TRACKING SUSTAINED AND MOMENTARY

The definition of an outage varies between utilities. Some refer to customer calls and/or reports from Supervisory Control and Data Acquisition systems. Many utilities do not track momentary outages. Those utilities that do track momentary outages use one to five minute durations to differentiate between momentary and sustained. Although the duration varied between utilities there was agreement on a key operational difference between momentary and sustained outages. The key operational difference between momentary and sustained is automatic vs. manual service restoration. Also, the responses about type of information gathered had considerable variation. It should be noted that the responses are paraphrased to save space.

Respondent	Outage Definition	Sustained / Momentary Duration	Type of sustained information gathered	Track momentary?	M/S Operational differences?
Wabash Valley Power Assn.	Not Defined		Only handle delivery point outages between member and supplier	Has not defined momentary and does not track	N/A
Jackson County REMC	Greater than 1 minute	> 1 minute	Date/Time, Outage Location, Outage Type, Event Type, Event Cause, Duration, # Affected, and Employee for reports and improvement	No	Momentary outages are more difficult to determine the cause.
Indiana Municipal Power Agency	N/A	N/A	N/A	N/A	N/A
Town of Knightstown	Customer calls 90% of time	All sustained except for Cinergy momentary outages	System improvements	N/A (Editor – seems to mean No)	N/A
Tipton Municipal Utilities	More than one customer call from the same area	More than one customer call from the same area	Do not regularly analyze outages	No	N/A
Richmond Power & Light Co.	Customer report or SCADA	> 1 minute	Cause, circuit, location, duration, customer count for system improvement	Customer report or SCADA	Automatic restoration for momentary. Outages are temporary.
Indiana Michigan Power Co (AEP)	Customer reports and monitored devices	IEEE 1366	Date, time, duration, location, customer count, cause for statistics and improvement	No formal plan – cost does not justify tracking. Investigate special cases	Automatic restoration for momentary. People dispatched for sustained.
Marshall County REMC	Customer report	>= 6 minutes	Name, location, phone number,	No. Not cost effective	Automatic restoration for

Respondent	Outage Definition	Sustained / Momentary Duration	Type of sustained information gathered	Track momentary?	M/S Operational differences?
			time, duration, cause, customer count for planning system improvements and feedback to customers & media	impact on rates	momentary. People dispatched for sustained.
NIPSCO	Customer report through Outage Restoration System and outage management software	>= 1.5 minutes	Location, substation, circuit, customer, duration, cause for statistics, complaint response, and improvements	Not tracked by permanent hardware. Use special equipment for customer request/concern	Sustained requires human intervention. Momentary is often proper operation of automatic equipment
Indianapolis Power & Light Co.	Zero voltage caused by operation of interrupting device	>= 2 minutes also reference to IEEE 1159 and IEEE 1366	Date, time, location, duration, cause, customer count, kVA for reporting and improvements	Yes	Customers call on sustained and requires IPL person to restore. Momentary have automatic restoration
Logansport Municipal Utilities	Customer report or SCADA	Power is restored before customer reports outage	Location, duration, customer count, clearing device and restoration actions	Yes. Generate a trouble ticket and employee response forth coming	Yes. Will respond to sustained without delay
Vectren Energy Delivery	Customer calls for distribution and SCADA for transmission	> 1 minute	Duration, customer count, cause, protective device for system improvements and to answer customer inquiries.	Not in reporting system. Respond to customer inquiries	Correct operation of automatic device clearing a temporary fault.
Edinburg Municipal Utilities	Whenever response person has to restore power	None stated but appears to be non-automatic restoration	Answer relates to restoration strategy only	Yes, in substation log books	Momentaries restored by automatic equipment. Sustained requires people to restore
Harrison REMC	Any interruption of power	Duration longer than recloser operation	Date, time duration, customer count, cause, equipment for future reference	Some identified by substation and line recloser inspection	
PSI/Cinergy	Complete loss of supply where customers are disconnected (IEEE 1366)	> 5 minutes (IEEE 1366)	Equipment, customers, customer calls, duration, cause for metrics, trends, and improvement	Use 1366 $MAIFI_E$ where practical. Use SCADA and substation inspection. Not line recloser	Momentary are temporary with automatic restoration. Sustained requires crew to restore
Frankfort City Light &	Customer or	>= 1 minute	Location, cause, customer count	Yes when reported by	Difficult to determine

Respondent	Outage Definition	Sustained / Momentary Duration	Type of sustained information gathered	Track momentary?	M/S Operational differences?
Power	group of customers report		for system and response time improvement	customer or recorded by field equipment	cause of momentary outage
Crawfordsville Electric Light & Power	Customer report or recorded by SCADA	>= 1 minute	Date, time, location, cause, customer count for statistics and recurring causes	No, except for SCADA and other means	Sustained requires immediate attention. Causes are difficult to determine
Indiana Industrial Group	IEEE 1366	IEEE 1366	N/A	Causes problems	N/A
Anderson Municipal Light & Power	Customer report or SCADA	>= 2 minutes	cause, circuit, protective devices, transformer size, area, customer count for improvements	Inferred yes from answer	automatic restoration, sometimes difficult to determine cause
Northeastern REMC	An event that requires someone to restore service	Duration requires a person to restore service	Location duration, customer count, cause	No. Investigate recloser operations if number seems high	Sustained requires a crew to restore service
Mishawaka Utilities	Customer calls	> 2 minutes	Record those with substation equipment or significant customer count (> 500 kVA load) for system & procedure improvements	Yes, by tracking substation recloser operations	Sustained outages normally don't burn through. Momentary are clearing of branch line fusing. (Editor – I think this is fuse saving strategy)
Washington Municipal Utilities	Anything over 3 minutes	> 3 minutes	Length of outage, material used, personnel	Less than three minutes, power restored thru substation and reclosers	No
Lawrenceburg Municipal Utilities	Blown transformer fuse, recloser lockout, or broken conductor	No time given, but appears to be cases that require physical response.	Use info to analyze outage cause and correct situations	Only when complaints	Sustained have blown fuse or "lockout" or broken conductor

ANNEX D – RESPONSE SUMMARIES FOR 2.3 - PERFORMANCE MEASURES AND STATISTICS

There was a high level of consistency among the utility respondents with respect to the various issues surrounding electric reliability statistics. All five IOU's in the State capture SAIFI, SAIDI, and CAIDI within an automated outage management system. By it's definition, ASAI is also an available metric for all of these companies as well, but is not used in the reporting of electric reliability nearly as universally as the former three metrics. Three of the four responding REMC's also track the above metrics but the majority of municipal respondents do not track these reliability measures. Momentary outages are tracked by IPL and PSI through MAIFI and MAIFI (e) while all others do not track these metrics. Only IPL, through its SCADA system, has the ability to report momentary statistics with a significant degree of data integrity. There are no other reliability metrics that are consistently tracked among the respondents.

There was also a high level of consistency in the philosophy that reliability statistics involved with major events should be tracked separately due to the likelihood of a major event skewing the results of a larger data set. All five IOU's capture their reliability data both with and without major events. The consistency ends however when reviewing the various strata utilized by the different companies to segment the reporting of reliability data into various operating conditions. Number of customer outages, minutes of customer outages, duration of outage restoration, forces of nature, and NWS severe weather warnings are among the variables used to define segments of reliability performance reporting.

There was also general agreement that reliability statistics SHOULD NOT be utilized to compare the reliability performance of utilities to one another. All acknowledged some characteristics of individual service territories affect reliability statistics. Some of these characteristics expressed include urban vs. rural, circuit length/age/location, customer density, and climatic differences.

Question 2.3.1	Typical reliabilitiy performance statistics include saidi, caidi, saifi, etc. Does your utility routinely calculate these statistics?	How is each of the variables in each of the calculations defined?	Are these statistics calculated as part of your outage management system or through some other means?
I&M	YES	IEEE STANDARD 1366	CAPTURED IN OMS
IPL	YES		CAPTURED IN OMS
NIPSCO	YES		CAPTURED IN NORS
PSI	YES	IEEE STANDARD 1366	ET
Vectren	YES	COOPER'S REFERENCE DATA SHEET R280-90-7	POWER ON OUTAGE SYSTEM
AML&P	NO		
CEL&P	YES	Industry definitions	Outage tracking software
Edinburgh Municipal Utilities	NO		
Frankfort City Light and Power	NO		
Harrison REMC	YES		In house data base

Question 2.3.1	Typical reliabilitiy performance statistics include saidi, caidi, saifi, etc. Does your utility routinely calculate these statistics?	How is each of the variables in each of the calculations defined?	Are these statistics calculated as part of your outage management system or through some other means?
IMPA	NO		
Jackson Co. REMC	YES		In house data base
Knightstown Municipal Electric	NO		
Lawrenceburg Utilities	NO		
Logansport Municipal Utilities	NO		
Marshall Co. REMC	NO		
Mishawaka Utilities	NO		
Northeastern REMC	YES		In house data base
Richmond Power and Light	YES	Industry standards	APPA
Triton Municipal Utilities	NO		
Wabash Valley Power Association	NO		
Washington Municipal Utilities	NO		

QUESTION 2.3.2	Are there other reliability statistics your utility calculates?	What are they?	How are they calculated?	How are the variables used to calculate them defined?	Are these statistics calculated as part of your outage management system or through some other means?
I&M	SOMETIMES		SAIDI = SAIFI X CAIDI		
IPL	YES	MAIFI, MAIFI(e)	Manually		EMS/SCADA
NIPSCO	NO				
PSI	YES	ASIAI, MAIFI(e)	SAIDI = SAIFI X CAIDI, ASAI = 8760-SAIFI X CAIDI / 8760		
Vectren	YES	Electric emergency response process			Outage management system
AML&P	NO				
CEL&P	NO				
Edinburgh	NO				

QUESTION 2.3.2	Are there other reliability statistics your utility calculates?	What are they?	How are they calculated?	How are the variables used to calculate them defined?	Are these statistics calculated as part of your outage management system or through some other means?
Municipal Utilities					
Frankfort City Light and Power	NO				
Harrison REMC	NO				
IMPA	NO				
Jackson Co. REMC	NO				
Knightstown Municipal Electric	N/A				
Lawrenceburg Utilities	NO				
Logansport Municipal Utilities	N/A				
Marshall Co. REMC	YES	RUS ANNUAL REPORT	MANUALLY		OUTAGE TICKETS
Mishawaka Utilities	NO				
Northeastern REMC	YES	ACMI, ASAI	In house database		In house data base
Richmond Power and Light	YES	ASAI	Customer minutes available/total customer minutes		APPA
Triton Municipal Utilities	N/A				
Wabash Valley Power Association	N/A				
Washington Municipal Utilities	NO				

Question 2.3.3	Does your outage management system calculate other reliability statistics that your utility does not routinely review?	What are these statistics?	How are they calculated?	How are the variables used to calculate them defined?
I&M	NO			
IPL	NO			
NIPSCO	YES	ASAI		
PSI	NO			
Vectren	NO			
AML&P	NO			
CEL&P	YES	Outages per circuit		
Edinburgh Municipal Utilities	NO			
Frankfort City Light and Power	N/A			
Harrison REMC	NO			
IMPA	NO			
Jackson Co. REMC	NO			
Knightstown Municipal Electric	N/A			
Lawrenceburg Utilities	NO			
Logansport Municipal Utilities	N/A			
Marshall Co. REMC	NO			
Mishawaka Utilities	NO			
Northeastern REMC	NO			
Richmond Power and Light	NO			
Triton Municipal Utilities	N/A			
Wabash Valley Power Association	N/A			
Washington Municipal Utilities	NO			

QUESTION 2.3.4	What are the advantages and disadvantages to excluding storms or other events?	Do reliability statistics typically calculated by your utility include or exclude storms or major outage events?	If these events are excluded, how do you determine when to exclude an outage event?	How do you define the different levels of outage events?
I&M	Major events can drastically increase reliability indices	Both		Two levels (outage restoration times that exceed 24 hours
IPL	Advantage - measurement of performance under consistent conditions disadvantage - does not provide accurate reflection of the performance customers experience	Both		Level i - 500 to 10,000 customers and power is restored in 24 hrs level ii -10,000 to 10% of customers affected and power is restored in 24 to 48 hrs level iii - greater than 10% of customers affected and power is restored in greater than 48 hrs
NIPSCO	Including storms skews data	Both		
PSI		BOTH		AS DEFINED IN PSI'S STORMS AND NATURAL DISASTERS PLAN
Vectren	Including storms skews data	Both		Major event is an event that applies forces beyond system design and results in major damage
AML&P		BOTH		
CEL&P		BOTH		
Edinburgh Municipal Utilities				
Frankfort City Light and Power	N/a			
Harrison REMC	Including storms gives accurate picture. Disadvantage one storm can affect numbers for several years	Includes major storms		
IMPA	N/a			
Jackson Co. REMC		Includes major storms		Major outage event takes multiple days to restore service to all customers
Knightstown Municipal Electric	N/a			
Lawrenceburg Utilities	N/a			
Logansport	N/a			

QUESTION 2.3.4	What are the advantages and disadvantages to excluding storms or other events?	Do reliability statistics typically calculated by your utility include or exclude storms or major outage events?	If these events are excluded, how do you determine when to exclude an outage event?	How do you define the different levels of outage events?
Municipal Utilities				
Marshall Co. REMC	Advantage to excluding storms is lower outage time per customer, disadvantage understate the hours customers are without service	Includes major storms		
Mishawaka Utilities	N/a			
Northeastern REMC	Advantage provides overall statistical analysis, disadvantage skews data	Both		
Richmond Power and Light		BOTH		
Triton Municipal Utilities	N/A			
Wabash Valley Power Association	N/A			
Washington Municipal Utilities	NO			

Question 2.3.5 Question 2.3.6 Question 2.3.7	How do service territory differences affect the calculation of reliability statistics	What statistic is most indifferent to the service area characteristics	Can the calculation of reliability indices be standardized among Indiana utilities	Explain how this can be done	Should utility size or other characteristics be taken into consideration when evaluating the reliability statistics from a company
I&M	Does not affect		YES	IEEE STANDARDS	YES
IPL	Compare like utilities	NONE	YES	IEEE STANDARDS	YES
NIPSCO	Length, age and location of electric facilities affect reliability statistics		YES	Ineffective	YES
PSI	Rural vs. urban affect reliability statistics		YES	IEEE STANDARDS	YES
Vectren	Load density, geographical area, climate	NONE	YES	Industry standards	YES
AML&P	Rural vs. urban affect reliability statistics	NONE	YES	Commission sets standards	YES
CEL&P	Terrain, size of territory, customer density, system design	NONE	YES	IEEE STANDARDS	YES
Edinburgh Municipal Utilities	N/a		N/A		N/A
Frankfort City Light and Power	Rural vs. urban affect reliability statistics		YES		YES
Harrison REMC	Rural vs. urban affect reliability statistics		NO		NO
IMPA	N/a		N/A		N/A
Jackson Co. REMC	Rural vs. urban affect reliability statistics		NO		YES
Knightstown Municipal Electric	N/a		YES	Based on percentages	N/A
Lawrenceburg Utilities	Rural vs. urban affect reliability statistics		YES	Number of outages per circuit and response time	NO
Logansport Municipal Utilities	N/A		YES	SIZE OF UTILITY	YES
Marshall Co. REMC	Load, consumer density and type		YES		YES

Question 2.3.5 Question 2.3.6 Question 2.3.7	How do service territory differences affect the calculation of reliability statistics	What statistic is most indifferent to the service area characteristics	Can the calculation of reliability indices be standardized among Indiana utilities	Explain how this can be done	Should utility size or other characteristics be taken into consideration when evaluating the reliability statistics from a company
Mishawaka Utilities	N/A		YES	INPO DATA	YES
Northeastern REMC	Rural vs. urban affect reliability statistics		MAYBE		YES
Richmond Power and Light	Rural vs. urban affect reliability statistics		YES		YES
Triton Municipal Utilities	Rural vs. urban affect reliability statistics		N/A	SIZE OF UTILITY	N/A
Wabash Valley Power Association	N/A		N/A		N/A
Washington Municipal Utilities	No		N/A		N/A

ANNEX E – RESPONSE SUMMARIES FOR WORST PERFORMING CIRCUITS

There was general agreement among the utility respondents that the advantages of identifying the top worst performing circuits was that it could be helpful in identifying areas on which further analysis might justify corrective action and if corrective action was warranted, the corrective action should improved reliability and customer satisfaction.

However, the respondents noted a number of disadvantages of identifying the top worst performing circuits. Following is a summary of those concerns:

1. Any ranking will result in a worst performing circuit, even if that circuit's overall performance is acceptable. Expenditure of resources to improve a worst performing circuit when its performance is acceptable would be imprudent.

2. The method of identifying the worst performing circuit may not lead to the circuit (or area) that has the greatest opportunity to improve overall reliability or customer satisfaction. Other circuits (or areas), other than the identified worst performing circuit, could actually be experiencing more significant problems or effecting greater number of customers. Focusing on worst performing circuits could result in miss directing time and resources from areas of greater customer benefit.

3. Improving reliability of some worst performing circuits may require significantly more resources than is justifiable due to either the few numbers of customers effected and/or the amount of corrective work required to achieve improvement.

4. There are disadvantages concerning customer perception associated with labeling "worst performing circuits." Customers may develop expectations of a need for improvement because of the labeling of "worst performing circuits." Absent the label of "worst performing circuit," these same customers may have had no expectation for a need to improve reliability. Customers are often accepting of lower levels of reliability giving recognition to their choice of location or other alternatives such as adequate tree clearance or higher rates.

Respondent	Q.2 What are the advantages of identifying the top worst performing circuits of a utility?	Q.3 What are the disadvantages of identifying the top worst performing circuits of a utility?
Wabash Valley Power Association	It should direct the utility's operation and/or maintenance activities to these areas on a priority basis.	A mathematical calculation associated with performance may result in an inordinate O&M effort in a limited number of areas.
Jackson County REMC	Could give you an idea where your maintenance dollars need to be concentrated.	Might identify lines that require more maintenance than others, but hard to justify due to number of connected consumers and generated revenue.
Indiana Municipal Power Agency	No response.	No response.
Town of Knightstown	You can correct the problems.	None.
Tipton Municipal Utilities	We do not have "pockets" of poor service reliability, probably due to size.	Size would make a difference.
Richmond Power & Light Company	Provides measurable data for developing system improvement projects.	Potentially leads to customer perception issues with "worst circuit." Any ranking will result in a worst circuit, even if that circuit's overall performance is

Respondent	Q.2 What are the advantages of identifying the top worst performing circuits of a utility?	Q.3 What are the disadvantages of identifying the top worst performing circuits of a utility?
Light Company		ranking will result in a worst circuit, even if that circuit's overall performance is acceptable. A customer may express dissatisfaction being served by the "worst" circuit on the system.
Indiana Michigan Power Company (AEP)	The identification of worst performing circuits can be useful to utilities in determining circuits on which detailed engineering analysis of potential circuit improvements is needed and/or justified.	There are no inherent disadvantages in identifying the worst performing circuits. The only real danger is in labeling the circuits "worst performing." Electric utilities should want to know where areas of lesser reliability are located. A disadvantage could exist if there is an expectation that a utility can always significantly or immediately improve the performance of any particular worst performing circuit in a cost effective manner. It also should be noted that customers served from a worst performing circuit are not always dissatisfied with their electric reliability. Also, if the worst performing circuits were determined by traditional indices, it is important to recognize that circuit length, load interrupted, and number of customers served would not be considered. For example, based upon index values alone, the circuit serving 50 customers with an annual SAIFI of 2.0 would be improved before the circuit serving 1,000 customers with a SAIFI of 1.9. Utilities consider many factors in developing their work plans.
Marshall County REMC	By identifying the worst performing circuits/lines, a utility is able to review it to determine what improvements are needed and/or justified.	The danger is labeling certain lines "worst performing." REMC's all want to know where their bad circuits are located. However, the utility may not be able to improve the reliability of a circuit/line because of excessive costs compared to revenue available. Even though a line may have a lot of outages, customers are not necessarily unhappy with the utility. They may prefer lower reliability to having adequate tree clearance or a higher rate.
NIPSCO	The advantages of identifying circuits through the circuit improvement program are twofold. First, money spent on remedial activity will hopefully produce the biggest return in the form of reliability, and second, this would provide a better opportunity for an improvement in customer satisfaction.	None.
Indianapolis Power & Light Company	The advantage of identifying and/or reporting the worst performing circuits to the Commission is to assure these circuits are identified and analyzed for corrective action on a routine basis. This should ultimately increase the satisfaction of the customers connected to those circuits and improve overall system reliability. Presently, IPL identifies the top worst performing circuits on our system, determines the root causes of the problems, and implements appropriate corrective action.	The disadvantage of regulatory reporting of the top worst performing circuits is the potential to focus disproportionately more utility attention on those circuits and less on other circuits with other significant problems. Also, generic problems on many circuits may receive less attention and focus, and this could result in lower overall customer satisfaction. It would be unreasonable to expect no variation among the performance of various circuits. Systems are dynamic. If we are not careful, we could find ourselves responding to natural variations in the systems, thus diverting attention from other needy areas, and forcing ever higher standards where they are not justified (by continually responding to the fail of the distribution curve when natural variation would cause different circuits to occupy the tail at various

Respondent	Q.2 What are the advantages of identifying the top worst performing circuits of a utility?	Q.3 What are the disadvantages of identifying the top worst performing circuits of a utility?
		times). Finally, additional reporting requirements may require additional manpower.
Logansport Municipal Utilities	During budget time, we will identify these areas and formulate a plan to reduce or eliminate the problem areas.	Customer perception of problem areas breeds distrust in the utility's ability to serve their customers.
Vectren Energy Delivery	Circuit-level reliability performance is captured by nearly all utilities, and can be used as an indicator of poor performing "pockets" of circuitry contained within the circuit coverage area.	Vectren's experience has shown that using circuit-level reliability performance to indicate "pockets" of reliability problems can be misleading. Vectren typically has between 800-1200 customers serviced by one 12.47 KV circuit. As referenced in question #2 above, an entire circuit with poor performance can certainly be an indicator of poor performing "pockets" contained therein. However, one can also have 12.47 KV circuits with a relatively good overall performance that still contain "pockets" of poor performing circuitry. By reviewing performance at the protective device level and the customer level, more effective reliability improvement objectives can be targeted. However, this type of information is difficult to obtain without a fairly robust Outage Management System.
Edinburg Municipal Utilities	Better customer relations by solving the problem.	Bad complaints by customers, more cost to the utility for overtime.
Harrison REMC	Identifying these areas helps determine where maintenance or upgrades need to be done.	While this may show you where problems are, it may not show areas they could get more customers helped for the same amount of money.
PSI/Cinergy	Identifying the worst performing circuits sometimes helps identify reoccurring problems that would otherwise go undetected.	Identifying the top worst performing circuits may not provide useful information. First, it is often difficult to accurately determine if the worst performance is a consistent problem, due to a concentration of weather events, or just a valid statistical variation from year to year. Second, it is difficult to account for variations in configuration between circuits. Third, it may not be the most efficient method of managing overall reliability. PSI has observed significant changes in relative ranking among circuits simply because of random outage events.
Frankfort City Light & Power	Provide ongoing information regarding service reliability.	Customer perception.
Crawfordsville Electric Light & Power	The advantage to identifying the top worst performing circuits is to further scrutinize those circuits to determine methods for improving their reliability, and to apply this knowledge to other areas as well.	The disadvantage of identifying the top worst performing circuits of a utility are customer perception they are not being treated fairly, and the possibility the utility may spend a disproportionate amount of time and resources on these circuits.
Indiana Industrial Group	No response.	No response.
Anderson Municipal	To provide information as to the cause, and develop a maintenance or	The disadvantages of identifying the worst performing circuits of a utility

Respondent	Q.2 What are the advantages of identifying the top worst performing circuits of a utility?	Q.3 What are the disadvantages of identifying the top worst performing circuits of a utility?
Light & Power	capital improvement plan to monitor system outages.	would be if the circuit having the most problems fall within the written guidelines provided by the Commissioner or IEEE. This would send a message to the customer they are being served by the worst part of the system when in reality they are not.
Northeastern REMC	We can better focus on the problem areas.	The worst area that may be identified may not be the best area to focus on. There may be another area that more consumers will benefit from the limited amount of funds that may be available for upgrades or maintenance.
Mishawaka Utilities	Identifying the “worst performing circuits” provides utility management information so reserves can be appropriately focused.	There are no disadvantages to identifying the “worst performing circuits,” as the methodology for determining the worst performing circuits takes into account the impact the circuit outages have on our customers.
Washington Municipal Utilities	Less outages.	N/A
Lawrenceburg Municipal Utilities	Advantages are having information to direct resources to the areas of need.	There are no disadvantages.

ANNEX F – RESPONSE SUMMARIES FOR SETTING PERFORMANCE STANDARDS

The large investor owned utilities already set performance standards to measure how they are performing. They have used this information in the past to gauge their performance internally. Most often the IOU's are using the industry standard CAIDI, SAIFI, and SAIDI measurements. The majority of the smaller utilities in Indiana have not used reliability performance measurements in the past.

The consensus from the responses to the questionnaire was that it is very difficult to compare utilities. There are too many differences as far as service territory, terrain, customer density, weather, customer base and other variables to make fair comparisons. It is felt utilities should not be compared to each other, but more to their own historical performance over an extended period of time.

Respondent	Does your Utility Set any Performance Standards?	Employee Compensation Tied to Performance?	Could Similar Standard be set to Compare with Indiana Utilities?	What are some Suggested Standards to Compare Service Quality?	Is I. C. 8-1-2.5 Used? Pros and Cons of Performance Based Rates
Wabash Valley Power Assn.	No	N/A	N/A	N/A	N/A
Indianapolis Power & Light Co.	CAIDI SAIDI SAIFI	Some	Difficult to compare all based on same standards. Some minimum could be set with an incentive for companies that exceed the minimum.	Difficult to fairly adopt uniform standards for all utilities.	Some experience with Elect Plan.
Vectren Energy Delivery	CAIDI SAIDI SAIFI	Yes, some in the past.	Individual performance could be based on 5 years or more of each utility's historical data. Not proper to measure among various utilities.	See previous reply.	Not used. Difficult to define appropriate criteria that are true measures.
Knightstown Municipal Electric Utility	No, try to improve every day.	N/A	Yes	N/A	Utilities do the best they can. Rating the Utilities perform no purpose.
Indiana Michigan Power Company (AEP)	SAIFI, CAIDI are measured at the District, Region, & Corporate levels.	If incentive plan goals are met, employees are rewarded.	IURC should not take a one size fits all. Utilities should not be compared against each other but rather evaluated.	Customer Surveys could be used as indicator of Service Quality.	Not aware of any problem with the structure.
NIPSCO	Employee goals & objectives are associated with	Some	No, should not set similar standards among Indiana Electric Utilities.	Comparison against the utility's own historical performance.	No, NIPSCO continues to work with certain parties in meeting obligations to

Respondent	Does your Utility Set any Performance Standards?	Employee Compensation Tied to Performance?	Could Similar Standard be set to Compare with Indiana Utilities?	What are some Suggested Standards to Compare Service Quality?	Is I. C. 8-1-2.5 Used? Pros and Cons of Performance Based Rates
	activities that are intended to impact reliability.				file for a risk-reward mechanism.
Edinburgh Municipal Utilities	No	No	No	No	No
Harrison REMC	Yes, some with response time to outages.	Some	Probably - if everyone figures their statistics the same way.	We think these standards will suffice in comparing service qualities among different utilities.	The amount of trouble and restoration time may be an indicator of who has kept their system well maintained and who has not.
PSI Energy, Inc.	SAIFI CAIDI	Some – Performance is to provide an incentive rather than simply setting an acceptable performance level	Could set standards, however, evaluations and comparisons must be used cautiously.	Compare a given utilities' performance against its own historical data – comparison should be over a long enough period to ensure variations in performance.	PSI doesn't know of any structural problems with the statute.
Frankfort City Light & Power	No	N/A	It would be difficult to make equitable comparisons.	N/A	N/A
Crawfordsville Electric Light & Power	No	N/A	Difficult to make valid comparisons given to vast differences in the utilities such as service territory, terrain, customer density, customer base, system design, weather condition and events.	CEL&P does not have a response.	CEL&P provides economic benefit to customers. Dedicated to supplying and delivering affordable and reliable services to the customers.
Anderson Municipal Light & Power	No	N/A	May be difficult to apply one set of standards to all utilities. A better approach might be to group similar size and types – example (rural to urban), may still have disadvantages.	Standards that are now in place should be reviewed and modifications made based on size, location, and area	N/A

Respondent	Does your Utility Set any Performance Standards?	Employee Compensation Tied to Performance?	Could Similar Standard be set to Compare with Indiana Utilities?	What are some Suggested Standards to Compare Service Quality?	Is I. C. 8-1-2.5 Used? Pros and Cons of Performance Based Rates
				served, etc.	
Northeastern REMC	No	N/A	Could be done if each utility is consistent with its calculations of the indices.	The outage indices would suffice	Not familiar enough with this to comment.
Mishawaka Utilities Electric Division	No	N/A	N/A	N/A	??????
Washington Municipal Utilities	Advanced classes of linemen. Ability to do the work.	N/A	No	N/A	N/A
Lawrenceburg Municipal Utilities	No	Not at present.	N/A	N/A	N/A
Jackson County REMC	No	N/A	Potential difficulty in trying to compare performance standards to all utilities.	Tried to discover suitable accurate measurement of service quality, but have not been successful.	Impossible to “normalize” performance statistics because of uncontrollable factors.

ANNEX G - IMPACT OF MODERN TROUBLE CALL OUTAGE MANAGEMENT SYSTEMS

It is known in the industry that utilities who implement new Trouble Call Outage Management Systems (TCOMS) often see reliability reports look worse even when actual reliability may be improving because as a result of the new TCOMS system. Further, the amount of change in reported reliability varies with the amount of reporting change between systems. Each TCOMS system and even different versions of TCOMS from the same vendors have differences that affect reliability statistics.

One utility sponsored a study in 1999 of utilities that converted to modern TCOMS to lean the impact. The study looked at reliability metrics one year before and one year after conversion for thirteen utilities. Results varied from a slight reliability improvement to showing reliability three times worse than before TCOMS. Nearly all of the utilities surveyed saw SAIFI increase with an average increase of 22%. CAIDI increase an average of 42% while SAIDI increased and average of 65%. One Indiana utility saw SAIDI more than double after a conversion in the mid 1990s.

Utilities who do not have modern TCOMS often handle calls with one system and maintain reliability records with a separate system. For example, a utility might have features in their customer billing system to collect outage calls. This system might simply print outage tickets for dispatchers to analyze, or it might perform basic analysis to help the dispatcher. More emphasis was sometimes placed on restoration than on record keeping especially during major storm events. Sometime after service restoration, utilities would collect the paper tickets, call information, switching information and enter the data into an outage record system. The level of sophistication of varied between systems. Customer counts and outage durations may have been estimates and subject to differing guidelines. Even best efforts could miss a significant number of records during a major storm.

Modern TCOMS use customer calls and supervisory data acquisition systems to directly initiate the final outage record. They track the connectivity of the electric supply for accurate customer counts. They also predict the most likely place where the outage originates on the system. They present distribution operators with a trouble case that must be dispatched and resolved. They provide customer count, start time, completion time and become the final record for reliability reporting. These features improve response time and improve accuracy of outage records.

However, even modern TCOMS are evolving as they improve. Different systems and even versions of the same systems may report different results. These differences do impact reliabity reports. Here are some simple examples of differences:

- Individual phases on three phase lines were not properly tracked. The system recorded all three phases out even when only one phase was out. A later enhancement allowed the operator to divide by three but still did not accurately count the customers on the phase that was out.
- Partial restoration is not handled well. Partial restoration occurs when the damaged equipment can be isolated by switching. This restores service to some, but not all of the customers. Sometimes partial restoration occurs in two or more steps.
    - Some systems would simply count all customers out for the entire duration until the last section is restored. This makes CAIDI and SAIDI artificially long.

    - Other systems might initiate a new outage case for customers restored. This might double count for SAIFI and make CAIDI shorter than it should be.

- Recording of callback results may differ. Assume a storm causes an outage for an entire feeder serving 1,000 customers. The storm creates undetected damage on a tap line on the same feeder that serves 100 customers. The 100 customers are not discovered until customer callbacks discover not customers were restored with the feeder. TCOMS may record this as two outage cases indicating the 100 customers had two shorter outages rather than a single long outage.
- Temporary configuration changes may not be tracked properly. The system may count customers out who were not out or may miss customers not normally served from a feeder that goes out.

ANNEX H - MUNICIPAL AND RURAL ELECTRIC UTILITIES

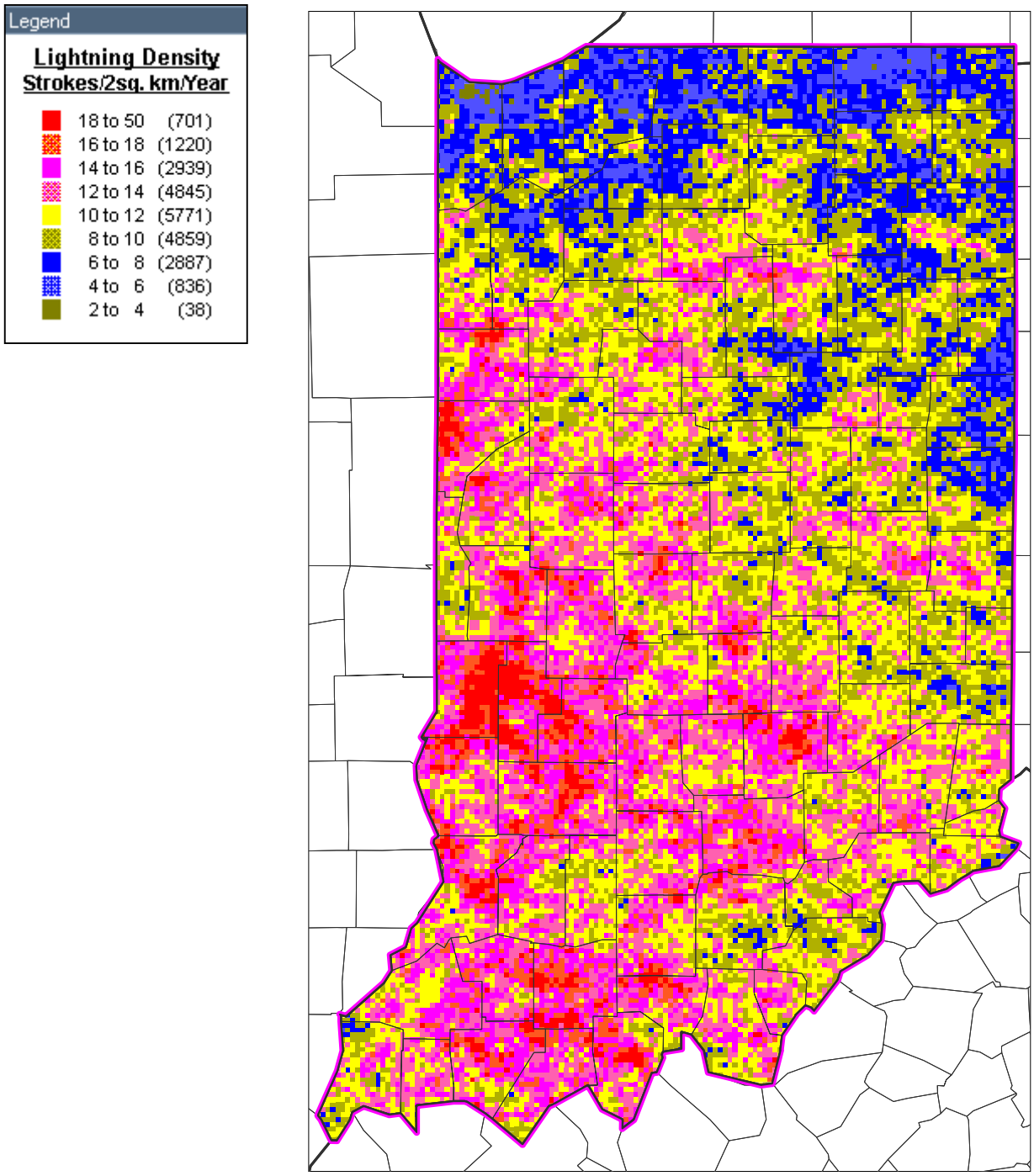
Rural Electric and Municipal Utilities under IURC jurisdiction follow: Data from various IURC, IMEA and Rural Electric publications.

	Reliability Metrics	Meters
Anderson	N	36,285
Mishawaka	N	25,276
Jackson Co. REMC	Y	22,676
Richmond	Y	22,106
Northeastern REMC	Y	21,772
Harrison Co. REMC	Y	19,427
Logansport	N	12,820
Peru		11,024
Frankfort	N	9,276
Crawfordsville	Y	9,251
Greenfield		7,830
Lebanon	N	7,765
Washington	N	7,268
Marshall Co. REMC	N	6,395
Auburn		6,095
Columbia City		4,395
Tipton	N	4,217
Lawrenceburg	N	3,318
Garrett		3,150
Bargersville		3,000
Edinburgh	N	2,900
Knightstown	N	1,812
South Whitley		1,031
Kingsford Heights		535
Straughn		175

Boonville
Fort Wayne
Paoli
Troy

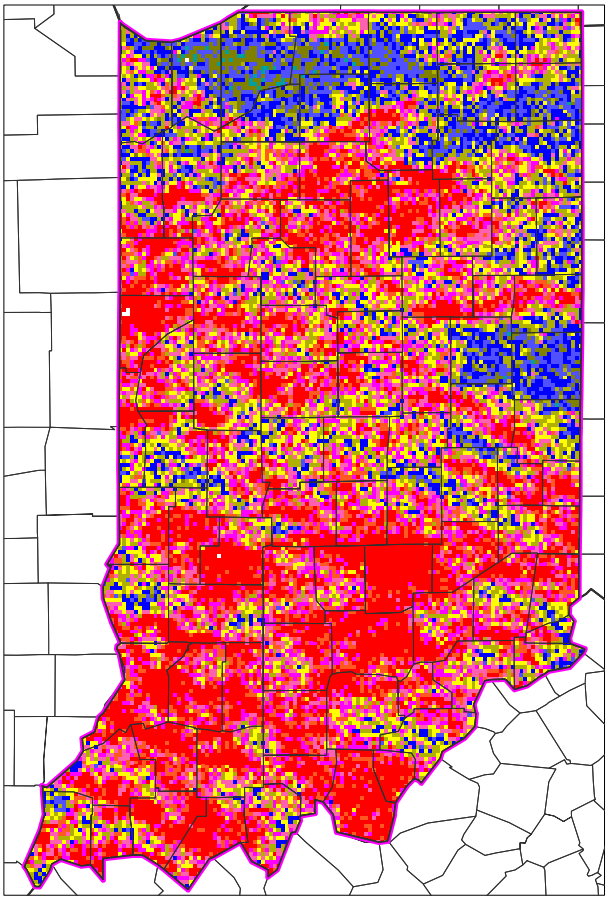
ANNEX I – CONSISTENT RELIABILITY

Although the Commission expressed a desire to maintain consistent reliability among electric service providers, weather and other factors make this difficult if not impractical. This lightning density map for Indiana summarizes all lightning activity from 1998 through 2002. It clearly shows a wide variation in lightning exposure. Analysis of yearly data also indicates wide variations over time as well as geography. Similar variations occur for snowfall, ice storms and other influences that cause regional variations in reliability within the state of Indiana.



Further, weather has significant variation from one year to the next. This makes trending difficult even with annual reporting of reliability data. Notice the difference in lightning exposure between 1998 on the left and 1999 on the right. Comparing reliability data between these two years could easily lead to incorrect conclusions without consideration for the many factors that significantly influence electric reliability.

Indiana Lightning Density 1998



Indiana Lightning Density 1999